

# Revision Hip Arthroplasty in Patients With a History of Previous Malignancy

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**Background and Objectives:** The potential association between implants and malignancy has been discussed in the literature, but never as a cause of loosening of joint arthroplasty.

**Methods:** The records of all patients who underwent revision arthroplasty at our institution between 1992 and 1995 were reviewed.

**Results:** Among 93 patients who underwent revision hip arthroplasties, 11 (11.8%) had a history of previous malignancy. At surgery, in 2 of these patients, metastasis was found to be the cause of loosening in the affected hip.

**Conclusions:** When revision hip arthroplasty is considered, patients with a history of malignancy require attenuated pre-, intra-, and postoperative workup. Management algorithm in such cases is proposed.

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**KEY WORDS:** metastasis; loosening; arthroplasty

## INTRODUCTION

Loosening of the prosthesis after total hip arthroplasty (THA) is frequently the result of either infection or aseptic loosening due to particulate debris from the implant [1]. It also may be due to poor fit and filling of uncemented implants, or poor cementing technique. Routine workup of a loose THA usually encompasses blood workup [complete blood count (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein], possible aspiration of the joint, radionuclide scans, and possible frozen section analysis at the time of surgery.

Ascertaining the cause of loosening is of utmost importance, since it often determines the type of revision procedure. Additional cytologic evaluation of the aspirated fluid from the loosened joint, as part of the preoperative evaluation of loosening, may be required. Proper evaluation in patients with a history of malignancy who need revision THA is of even greater importance, since inappropriate treatment may jeopardize patient survival.

We present our proposal for management algorithm of patients with a history of malignancy who need revision

THA. Two illustrative cases in whom metastasis caused the loosening are emphasized.

## MATERIALS AND METHODS

Between April 1992 and April 1995, 93 patients (61 women, 32 men) with an age range of 52–83 years (mean: 69.2 years) underwent revision THA at our institution. The preoperative diagnoses of the cases were infection (19, 20.4%); aseptic loosening (69, 74.1%); breakage of either prosthetic component (6, 5.5%). Eleven patients, who are the scope of this article (8 females, 3 males), had a previous history of malignancy (breast, 5; ovary, 2; prostate, 2; colon, 2). They were treated and followed up at the relevant oncologic outpatient clinics.

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### Method

Preoperative workup of the patients included serial X-ray radiographs, technetium-99 ( $^{99}\text{Tc}$ ) and gallium-67 ( $^{67}\text{Ga}$ ) bone scans, blood tests of CBC, ESR, C-reactive protein, and specific immunologic marker levels: carcinoembryonic antigen (CEA) and prostate specific antigen (PSA). Joint aspiration was performed on 6 patients. An update report from the treating oncologist was also received. Intraoperative frozen-section analysis of the tissues surrounding the loose prosthesis was performed in the latter 6 patients.

### RESULTS

The preoperative evaluation for the 11 patients yielded 2 cases of infection (methicillin-resistant *Staphylococcus aureus*) and 9 cases of aseptic loosening, of which 4 were found to be the result of local metastasis during surgery only. At surgery, 7 cemented prostheses were replaced by long-stem, cementless prostheses. Two cases of infection were treated by staged revision to cementless prosthesis. In one of the metastatic cases, the prosthesis was removed ("resection arthroplasty"), and in the other case composite massive bone allograft and a long-stemmed, cementless prosthesis was inserted.

The death of the 2 patients described here occurred during the follow-up period, 28 days and 14 months postoperatively. The remaining 9 patients are alive, with no evidence of exacerbation of their malignancies. Their average postoperative Harris hip score was 83.6 (compared to 50.1 preoperatively), at a mean follow-up of 39 months.

### Illustrative Cases

**Case 1.** A 75-year-old woman underwent a total hip replacement after nailing of a nonpathologic fracture in her right hip had failed. Two years later she underwent a sigmoidectomy for carcinoma of the colon. The patient was subsequently treated with systemic chemotherapy and was considered free from disease for 3 years.

Five years after the hip arthroplasty the patient began to experience increased hip pain on walking. Hip joint radiographs demonstrated loosening of the prosthesis (Fig. 1). Several  $^{99}\text{Tc}$  bone scans showed positive uptake at the affected hip which was interpreted as loosening, yet with no evidence of osseous metastasis. At surgery, a large quantity of particulate debris-like material was found at the joint area, where both prosthetic components were found to be loose.

On the assumption of infected loosening, a 2-stage procedure for revision was elected, and the prosthesis was removed. Pathologic evaluation of the material retrieved from the joint and around the components revealed a metastatic adenocarcinoma of colonic origin. Computerized tomography of the hip showed a destructive process of the acetabular area (Fig. 2). Secondary



Fig. 1. Case 1. Loosening of a cemented hip arthroplasty 5 years postoperatively.

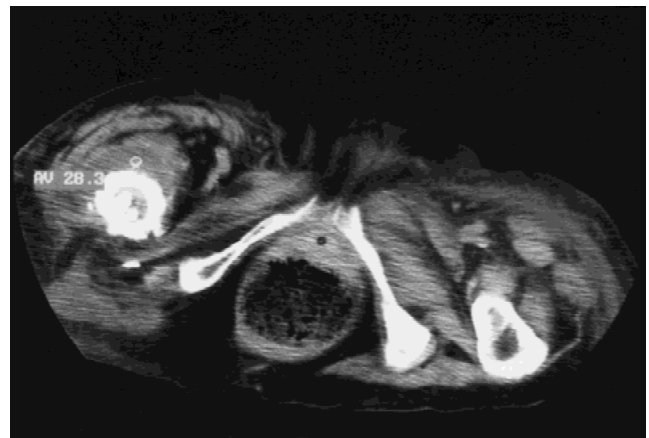


Fig. 2. Case 1. Computerized tomography of the periacetabular region demonstrating the destructive process.

infection occurred in the wound, and the patient died of sepsis and suspected brain metastasis 28 days after the revision surgery.

**Case 2.** A 73-year-old woman who had undergone a THA 3 years previously was examined at our outpatient clinic because she was experiencing increasing pain in



Fig. 3. Case 2. Loosened hip arthroplasty 3 years postoperatively (note osteolysis on the periosteal side).



Fig. 4. Case 2. Pathologic fracture at the stem of the prosthesis.

that hip. Radiographs of the hip joint showed loosening of the prosthesis and the patient was scheduled for revision arthroplasty (Fig. 3). Preoperative evaluation comprising ESR, CBC, C-reactive protein, and positive  $^{99}\text{Tc}$  and  $^{67}\text{Ga}$  scans evoked a high suspicion of infection.

While awaiting surgery, the patient suffered a pathologic fracture of the proximal third of the femur, due to a destructive process suspected as being the result of aggressive infection (Fig. 4). Aspiration cultures of the joint were negative.

At surgery, frozen section of material taken from the eroded bone revealed a suspected metastasis from lung carcinoma (Fig. 5). Removal of the entire proximal femur and reconstruction by way of a "composite" bone allograft and hip joint prosthesis were then performed (Fig. 6).

The patient died from her lung carcinoma 14 months after surgery.

## DISCUSSION

The potential association of malignancy and joint replacement has been of concern to many orthopedic surgeons, almost since the introduction of joint arthroplasty.

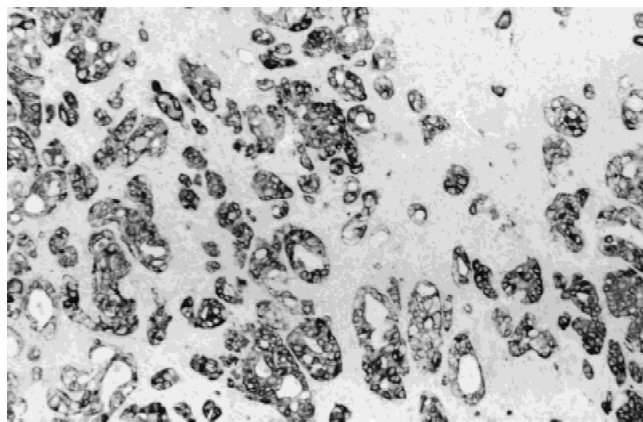


Fig. 5. Case 2. Frozen section of the particulate, debris-like material compatible with metastatic lung carcinoma.

The plea for an international survey of such an association resulted in the conclusion that the relationship is probably coincidental [2,3]. However, some authors suggest that total joint replacement is a major cause of chronic stimulation of the immune system, due to the debris from the artificial joint [4].

Several studies that have discussed the correlation between orthopedic metal implants and sarcoma have pos-

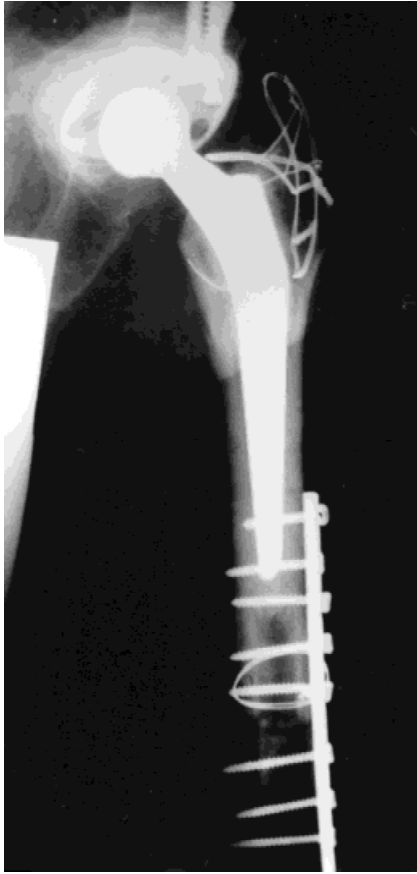


Fig. 6. Case 2. Reconstruction by massive allograft and cemented hip prosthesis.

tulated that metals seem to be associated with carcinogenicity through physical and chemical effects, such as metal-protein interactions, metallic corrosion, localization, and transportation within the tissues [5–7].

It should be noted that one patient suffered from a colorectal carcinoma. Axial skeletal osseous metastasis as a result of this disease is uncommon and is predominantly found in the vertebral column, specifically the lumbar and sacral regions [8,9].

The metastasis that caused the loosening of a hip prosthesis after arthroplasty, as found in this study, should draw the attention of orthopedic surgeons to such a possibility when faced with a case of loosening, especially in patients with a history of malignancy. Every effort

should be made to exclude metastasis as a cause of loosening prior to further surgery. Algorithm of evaluation of a patient with previous, or recently diagnosed, cancer should include (A) preoperatively—(1) full blood workup including ESR, CBC, and C-reactive protein; (2) specific immunogenic markers (if available) should be measured (if these marker levels are high, revision THA should be postponed until a current malignant condition is verified); (3)  $^{99}\text{Tc}$  and  $^{67}\text{Ga}$  are mandatory; (4) joint aspiration is also mandatory to exclude infection, and for cytologic examinations; (B) intraoperatively—frozen section analysis of tissues surrounding the loose prosthesis should be carried out (accordingly, surgeons should be prepared to change the surgical approach: staged revision rather than single-stage revision, or change the type of the prosthesis); and (C) postoperatively—preoperative workup evaluation should be followed up postoperatively.

In conclusion, it seems from this study of a small number of patients that metastatic spread to an area of a loose THA should be suspected and included in the differential diagnosis of loosening. Special attention and specific workup should be given in patients with a previous, or recently diagnosed, cancer.

Further evaluation of a larger series of patients in registered cancer institutions may shed light on the possible association between joint arthroplasty and the seeding of metastatic disease.

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